OREGON CONSERVATION ASSOCIATION
J. N. TEAL, President :: A. B. WASTELL, Secretary

Wood-Using Industries of OREGON

WITH SPECIAL REFERENCE TO THE PROPERTIES AND USES OF OREGON WOODS

BY
HOWARD B. OAKLEAF
United States Forest Service

Prepared in co-operation with the United States Forest Service under the direction of A. B. Wastell, Secretary Oregon Conservation Association, and J. B. Knapp United States Forest Service

PORTLAND, OREGON
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PREFATORY NOTE

This study of the wood-using industries of Oregon was made, co-operatively, by the United States Forest Service and the Oregon Conservation Association. The purpose of the study is to show the amount of material annually consumed by the various industries at present operating in the state, the kinds of wood used and the characteristics of the woods which make them desired for their specific purposes. In addition, suggestions concerning the utilization of small pieces and various other forms of waste were obtained. The statistics were compiled by totaling and tabulating returns sent in by the many firms. Great care was taken to make the totals accurate through careful computation, so the authenticity of the figures depend entirely upon the exactness with which the manufacturers submitted their reports and the completeness of the list used in sending out the inquiry forms. Every effort was made to compile a full list of wood-using firms. Lists of diverse origin were correlated and, in addition, the secretaries of commercial organizations throughout the state were requested to send in the names of wood-users in their vicinity. Because of this effective manner of obtaining the names of the firms, it is felt that the number of firms omitted is negligible.

The average price given in the third column of the individual species and industry tables, refers to the average price of the grades used and not the average price of the total amount of material purchased. For instance, the average price of Douglas fir grades used for boat building was $30.71, but the average price of all of the boat material consumed was about $18.00, because the larger amount of material consisted of low grades used in barge construction.

In many cases only one firm reported on the use of a particular wood, and in such cases the price does not exactly represent the average price of the wood. These cases are apparent in the tables, since the maximum and average are the same. Where small quantities of a particular species are consumed, the cost is very much higher than would be the case if a larger amount were consumed. The amount of a wood consumed is no criterion of its relative value for a particular use, since in many cases the availability and cost are the only features considerd in its use.

This report is intended to point out the kind, character and amount of each wood used by the various industries in the state, with a view to bringing about a better understanding of the Oregon woods and their uses. A similar report has been prepared for the State of Washington.

INTRODUCTION

The State of Oregon is reported to have nearly four hundred billion feet of standing timber, an amount equal to approximately one-sixth of that now remaining in the United States. It would seem that Oregon should be among the foremost lumber producing states, but, owing to the present inaccessibility of much of the timber, its operation is greatly retarded. Oregon ranked ninth in 1909 in the production of lumber, having cut nearly two billion feet, and it is very probable that the 1910 cut will equal and possibly exceed the above amount. Of the two billion feet of lumber annually sawed in this state, four hundred million is shipped out by water and eight hundred million by rail. Of the remaining eight hundred million board feet consumed in the state, approximately 25 per cent is further manufactured into the various products considered in this report. The balance goes into general building and construction work.

Oregon has seventeen commercial species, representing fourteen genera, with woods of diverse color and texture, ranging from the very hard deciduous trees, such as the oaks, ashes and maples, to the soft evergreen pines, firs and spruces.

Nineteen distinct wood-using industries are operating in the state, and the plants comprising the various industries represent investments of from a few thousand dollars in the small woodworking shops to several million dollars in the pulp mills.

The annual consumption of all of the wood-using industries of the state is 296,791,900 board feet, nearly two hundred million feet of which is actually purchased in the form of lumber, the balance being obtained in the form of logs and cordwood. The purchase of this raw material represents an expenditure of about four and three-fourths million dollars. Of the 296 million feet annually consumed, less than one per cent is obtained outside of the state, as is shown by Table No. 19, giving a summary of consumption by species. Table No. 1 gives a summary of the industries, showing annual consumption and the estimated cost of the material consumed by each industry.

This report of the wood-using industries of Oregon includes all such industries except those manufacturing lumber and shingles. Lumber and shingles were purposely omitted, since the Bureau of the Census, in co-operation with the Forest Service, annually obtains statistics of the production of these commodities. Planing mill products, such as flooring, ceiling, siding, rustic, etc., commonly produced in connection with many of the sawmills, were also neglected because of the close association of these forms with the general lumber business. Figures reported by manufacturers of trunks, barrels and similar articles were omitted where the wood is received in a finished form and the process of manufacture consists of mere assemblage and union of the parts.

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INDUSTRIES

The pulp plants annually utilize more wood than any other industry. However, the total cost of the wood is less than that required by the box and sash and door manufacturers, who rank next to pulp manufacturers from the standpoint of annual consumption. The figures for excelsior, baskets and veneers,

TABLE NO. 1—SUMMARY OF CONSUMPTION BY INDUSTRIES.

INDUSTRY.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL CONSUMED	ESTIMATED COST*
Pulp	93,367,600	31.46	$ 768,012
Boxes	77,946,500	26.27	948,969
Sash and Doors	43,158,500	14.55	774,847
Interior Work	22,666,600	7.64	560,414
Cooperage	20,685,000	6.97	520,005
Boats	14,900,400	5.03	481,924
Furniture	9,853,250	3.32	293.518
Excelsior	4,320,000	1.46	27,000
Baskets and Veneers	3,102,500	1.05	39,330
Handles	1,854,400	.63	49,957
Fixtures	1,585,700	.54	149,539
Distillation	800,000	.27	4,000
Miscellaneous	694,200	.23	27,237
Caskets	470,000	.15	7,520
Patterns	379,050	.12	19,403
Columns	304,000	.10	7,600
Saddles and Stirrups	208,500	.07	4,745
Matches	200,000	.06	2,500
Vehicles	198,200	.06	20,717
Pulleys	97,500	.02	1,514
TOTAL	296,791,900	100.00	$4,708,731

*Cost F. O. B. Factory.

handles, fixtures and distillation give excellent examples of the relative value of the material consumed by the different industries, depending upon the form, quality and species required. A complete discussion of each of the more important industries follows:

PULP AND PAPER.

Pulp mills consume more wood than any of the other wood-using industries in the state, and half as much as all the rest combined. Both mechanical and sulphite processes are used in converting the wood into pulp. The mechanical method consists of reducing the wood by pressing short bolts against a rapidly revolving wet grindstone. In the sulphite process the wood, after being chipped into small particles, is cooked for several

hours in a dilute solution of sulphurous acid. This cooking destroys the ligneous portion of the wood and leaves the cellulose in a soft disintegrated mass.

The wood is received at the pulp mills both as cordwood and in the log. Green wood is universally employed.

The paper produced by Oregon mills is practically all used west of the Rocky Mountains.

TABLE NO. 2—PULP AND PAPER.

SPECIES.	ANNUAL CONSUMPTION CORDS.	EXPRESSED IN FEET B.M.	PER CENT OF TOTAL.	AVERAGE COST PER CORD.	GROWN
Western Hemlock.....	58,953	47,162,400	50.52	$5.00	Oregon.
Sitka Spruce.....	35,642	28,513,600	30.54	9.00	Oregon.
Noble Fir.....	8,318	6,654,400	7.12	7.00	Oregon.
Black Cottonwood.....	9,222	5,533,200	5.93	6.50	Oregon,
White Fir.....	6,880	5,504,000	5.89	5.00	Oregon.
TOTAL.....	119,015	93,367,600	100.00		

Note—1 Cord Hemlock, Spruce, etc., equals 800 board feet; 1 Cord Cottonwood equals 600 board feet.

For pulp manufacture soft white non-resinous woods are preferred. Western hemlock, which is not an exceptionally good pulp wood, forms a large percentage of the amount annually consumed in this state, because Oregon produces news paper, wrapping paper and other inferior grades exclusively. Douglas fir is employed to some extent in making paper in Washington, though none is reported for Oregon.

BOXES.

The box industry, which consists of the manufacture of packing cases, fruit and salmon boxes, crates and similar packages, is exceeded only by the pulp in consumption of wood.

TABLE NO. 3—BOXES.

SPECIES.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.		GROWN.
			Average.	Maximum.	
Sitka Spruce.....	38,550,000	49.45	$11.93	$20.00	Oregon.
Western Hemlock.....	11,800,000	15.14	12.03	18.00	Oregon.
Western White Pine...	10,525,000	13.50	11.25	13.00	Oregon.
Noble Fir.....	6,453,500	8.28	10.12	14.00	Oregon.
Western Yellow Pine...	4,808,000	6.17	12.57	15.00	Oregon.
Sugar Pine.....	4,050,000	5.19	15.00	15.00	Oregon.
Douglas Fir.....	1,650,000	2.12	12.66	18.00	Oregon.
White Fir.....	110,000	.15	11.00	11.00	Oregon.
TOTAL.....	77,946,500	100.00			

The box industry in this state is provided with several suitable and plentiful woods. In the western and northern parts of the state, spruce and hemlock are the principal woods used, while in the southern and eastern parts, sugar and yellow pine are largely consumed for this purpose.

Box wood should be white, tough, light, strong, cheap, abundant, not easily split and capable of holding nails well. For some boxes the wood should be odorless and non-resinous, in order that foodstuffs contained therein may not be contaminated. Sitka spruce, Western hemlock, Noble fir, and Black cottonwood are particularly suited for boxes in which edibles are to be shipped. Douglas fir and yellow pine are used where their greater strength is needed. Sugar pine and white pine make excellent box woods, because they are light and easily worked.

Box manufacture usually consists of surfacing and sawing the air-dried and kiln-dried boards into proper sizes, stamping the name of the firm on the boards and nailing them together, or packing the shooks in bundles for shipment.

The waste in box manufacture amounts to 15 or 20 per cent and occasionally more. The boxes are all used in Oregon and the Northwest, with the exception of those sent to California.

SASH AND DOORS.

The manufacture of sash and doors is one of Oregon's most important industries, because of the unusual availability and large quantity of cheap and adaptive woods.

Although the so-called "low-grade" doors form the greater part of the product, there are a few high-grade doors manufactured. Rotary cut Douglas fir veneer is used in facing better grade doors, because of the beautiful grain which appears on the fir when cut in this manner.

TABLE NO. 4—SASH AND DOORS.

SPECIES.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL	COST OF GRADES USED PER M. FEET B. M.		GROWN.
			Average.	Maximum.	
Sitka Spruce.....	20,557,000	47.63	$18.00	$33.00	Oregon.
Douglas Fir.....	9,161,500	21.24	20.10	25.00	Oregon.
Western Red Cedar....	6,290,000	14.58	18.00	30.00	Oregon.
Port Orford Cedar.....	4,000,000	9.27	17.00	17.00	Oregon.
Western Hemlock.....	2,950,000	6.83	12.00	12.00	Oregon.
Western Yellow Pine...	125,000	.28	21.50	28.00	Oregon.
Western White Pine...	75,000	.17	18.00	18.00	Oregon.
TOTAL.....	43,158,500	100.00			

Woods adapted to use as sash and door material should be straight grained and hard, yet soft enough to be easily worked. In addition, the wood should resist checking and warping. Lightness, cheapness and affinity for paint are frequently advantageous. Beauty of grain is essential where the doors are to be stained instead of painted, and in this instance Douglas fir and Western hemlock excel all other species of soft woods, with Western yellow pine and Western red cedar as substitutes. For ability to take paint, Western red cedar, Sitka spruce, Western hemlock and the white pines are especially noteworthy. Red cedar, Port Orford cedar and white pine are more easily worked than any of the other woods.

Thoroughly dry lumber is always used for sashes and doors, in order to avoid deformation in the finished product and because such lumber is worked more easily. In the case of Douglas fir and yellow pine, thorough kiln drying is necessary in order to kill the pitch and resin in the wood.

The waste in the manufacture of the above products varies in accordance with the nature of the output of the plant and the character of raw material purchased. Waste frequently amounts to 15 or 20 per cent, but has been reduced in some instances to 5 per cent by the utilization of all small pieces for sash stock.

The field of trade for sash and doors at the present time is practically limited to this state, although some are sent to Idaho, Utah and the Atlantic States. Eastern States will undoubtedly draw on this state for this class of product as the white pine of the East becomes scarcer. The opening of the Panama Canal will no doubt eventually widen the market for locally produced sash and doors.

INTERIOR WORK.

The manufacture of mouldings and finish constitute the larger part of the material considered under this head, although all products, such as shelving, wainscoting, drain boards, stair material and other forms generally referred to as "shop work" are included. These figures, however, do not include the planing mill forms produced in connection with sawmills.

Wood capable of utilization for mouldings and finish should, above all else, be readily worked. Beauty of grain is a requisite where the wood is to be stained, but otherwise cheapness, smoothness and affinity for paint are of greater import. Douglas fir is most used because of its abundance, cheapness and attractive

grain. Western hemlock, however, also has a very pleasing grain and is often preferred to Douglas fir because of its lack of pitch. Port Orford cedar, Sitka spruce, Western red cedar, redwood and the pines are more easily worked than the other woods commonly used for this purpose.

The material is usually purchased in the form of air and kiln-dried 1-inch rough lumber. Practically all of the forms produced under this head are consumed locally.

Table No. 5 shows that 97 per cent was grown in Oregon and the balance was furnished about equally by other states and foreign countries.

TABLE NO. 5—INTERIOR WORK.

SPECIES.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.		GROWN.
			Average.	Maximum.	
Douglas Fir	18,757,000	82.80	$22.00	$30.00	Oregon.
Western Red Cedar	1,530,000	6.75	23.50	30.00	Oregon.
Sitka Spruce	1,089,000	4.80	36.88	50.00	Oregon.
Western Hemlock	425,000	1.87	25.00	25.00	Oregon.
Western Yellow Pine	76,000	.33	30.00	45.00	Oregon.
Port Orford Cedar	75,000	.33	50.00	60.00	Oregon.
Western White Pine	22,000	.09	50.00	75.00	Oregon.
Oregon Ash	20,000	.08	30.00	35.00	Oregon.
Oregon Maple	20,000	.08	28.00	32.00	Oregon.
Oregon Oak	10,000	.04	30.00	35.00	Oregon.
Sugar Pine	7,000	.03	45.00	50.00	Oregon.
Red Alder	1,000	.01	28.00	33.00	Oregon.
Total of Oregon woods	22,032,000	97.21			
Redwood	150,000	.66	$ 30.00	$ 40.00	California.
Eastern Oak (quartered)	44,000	.19	110.66	140.00	East.
Eastern Oak (plain)	35,000	.15	90.00	130.00	East.
Eastern Ash	3,000	.01	95.00	95.00	East.
Red Birch	1,500	.006	124.00	124.00	Michigan.
Yellow Poplar	1,000	.004	100.00	120.00	East.
Total of other U. S. woods	234,500	1.02			
Mahogany (P. I.)	255,000	1.13	$117.50	$150.00	Philippines.
Mahogany (African)	75,100	.33	195.00	250.00	Africa.
Siberian Oak (plain)	50,000	.23	60.00	60.00	Japan & Siberia
Siberian Oak (quarterd)	20,000	.08	90.00	90.00	Japan & Siberia
Total of foreign woods.	400,100	1.77			
Grand Total	22,666,600	100.00			

COOPERAGE.

In this industry are included not only tanks, barrels, kegs, ice cream tubs and various forms of woodenware, but also wood stave pipes, which are being so widely used in the development of power, irrigation and city water projects. This is an exceedingly important industry from a wood utilization standpoint,

since the manufacturers purchase only the very best grade of lumber.

For the manufacture of wood stave pipes and tanks, a strong, straight grained, durable, fairly hard wood is required, and this demand is well met by both Douglas fir and redwood. For tight cooperage, hard, strong, tough, compact woods are desired, and for this purpose Douglas fir is well adapted, unless the commodity to be contained in the barrel or tub is an article of food or is of an alcoholic nature. Douglas fir cannot be used for the manufacture of barrels for the latter purposes unless lined with paraffine, because of the large amount of resin in the wood, which imparts a taste to encased commodities.

TABLE NO. 6—COOPERAGE.

SPECIES.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.		GROWN.
			Average.	Maximum.	
Douglas Fir	20,430,000	98.77	$25.00	$28.00	Oregon.
Sitka Spruce	40,000	.19	30.00	30.00	Oregon.
Oregon Oak	200,000	.97	§		Oregon.
Western Red Cedar	15,000	.07	37.50	37.50	Oregon.
TOTAL	20,685,000	100.00			

§ Staves.

In making cases for food stuffs, Sitka spruce is preferably employed, and in the manufacture of beer barrels Oregon oak is used exclusively. For ice cream tubs and buckets, Western red cedar is an excellent wood because it does not warp or check, is durable and in addition it takes paint well.

For tank purposes and pipe manufacture, thoroughly dried rough, clear lumber is purchased. In the manufacture of barrels, kegs, etc., the coopers usually purchase their material in the form of staves and heads, either rough or manufactured; only thoroughly air seasoned stock is used. Oregon oak applied to the manufacture of beer barrels is seasoned for two or three years prior to consumption. The tank and pipe products are shipped to all parts of the United States, Alaska and Mexico, while the barrels, kegs, etc., are consumed locally and along the coast.

BOATS.

As is shown by the amount of material annually consumed for this purpose, boat building is one of Oregon's important wood-using industries. This industry includes the construction of all

types of boats from canoes, racing shells, rowboats and launches to large river boats, barges and sailing vessels. Owing to the large variety of forms of boats constructed, the material consumed varies greatly in quality.

Because of the large number of uses of wood in boat building, the properties desired are very diverse. For example, frames, ribs, keels, stems, spars, etc., are constructed of strong, tough, bendable woods, such as the oaks, while the planking, lining, decking and siding are usually made of the more available, and, hence, cheaper woods. For frames and ribs the oaks are preferred, because of their strength and bending properties, although Douglas fir is sometimes substituted because of its cheapness.

TABLE NO. 7—BOATS.

SPECIES.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.		GROWN.
			Average.	Maximum.	
Douglas Fir	14,265,500	95.74	$30.71	$45.00	Oregon.
Port Orford Cedar	192,400	1.29	59.54	85.00	Oregon.
Western Red Cedar	166,500	1.12	38.00	50.00	Oregon.
Sitka Spruce	120,500	.81	48.75	55.00	Oregon.
Oregon Oak	31,000	.21	50.50	70.00	Oregon.
Myrtle	5,500	.04	55.00	60.00	Oregon.
Sugar Pine	1,000	.006	60.00	70.00	Oregon.
Total of Ore. woods	14,782,400	99.216			
Eastern Oak	73,100	.49	$127.91	$150.00	East.
Red Gum	5,000	.04	95.00	95.00	East.
Eastern Maple	1,000	.007	110.00	110.00	East.
Eastern Ash	1,000	.007	110.00	120.00	East.
Yellow Poplar	600	.005	110.00	120.00	East.
Total of other U. S. woods	80,700	.549			
Siberian Oak	25,000	.16	$75.00	$85.00	Japan & Siberia
Iron Bark	4,750	.03	120.00	140.00	Australia.
Mahogany (African)	2,650	.01	262.50	300.00	Africa.
Mahogany	1,100	.007	200.00	250.00	Honduras.
Rosewood	1,000	.007	150.00	150.00	Australia.
Teak	1,000	.007	250.00	250.00	India.
Mahogany (Philippine)	1,000	.007	150.00	150.00	Philippines.
Rungus	500	.004	100.00	100.00	So. America.
Spanish Cedar	300	.003	150.00	150.00	Mexico.
Total of foreign woods	37,300	.235			
Grand Total	14,900,400	100.00			

Woods used as finish depend entirely upon the desire of the purchaser and the character of boat. Douglas fir is most commonly used for the cheaper interior work, while Siberian and Eastern oak, Port Orford cedar, myrtle, mahogany and teak are used in finishing the higher class boats. For strakes, fenders and noses, a hard, tough wood is required in order that impact and abrasion may be resisted. Iron bark, eucalyptus and other

tropical woods serve this purpose, although frequently the Oregon and Eastern oak are employed. For this purpose the Oregon oak is more suitable than the Eastern oak, because it is harder and therefore more resistant to abrasion.

In constructing rowboats and racing shells, the lighter woods, such as red cedar, spruce and Port Orford cedar, are desired; however, in the building of cheap rowboats, Douglas fir is sometimes substituted.

Boat material is usually purchased in the form of lumber and timber of different thicknesses. Air seasoned wood is preferred because it is said to have more life than kiln-dried material.

A very limited amount of equipment is necessary in boat building. This usually consists of saws, planers and steam boxes for preparing the wood which is to be bent.

The amount of waste in boat building is estimated at from 5 to 20 per cent, depending upon character of work conducted.

The field of trade supplied by boat builders is limited to the port of Portland and adjoining ports on the Pacific Coast and Alaska.

FURNITURE.

Since a very large majority of the furniture used in the state is shipped in, some from Washington, but most from the East, there is every reason to believe that Oregon offers an excellent opening for new furniture factories. The growth of the industry has been greatly handicapped because of the scarcity of suitable raw material. With the opening of the Panama Canal, however, Eastern hardwoods will be imported so much more cheaply that a rapid growth of the furniture industry is predicted. Although many of the local woods are suitable for various parts and kinds of furniture, the greater portion of the high grade furniture stock must be brought from the East; for this reason, at the present time fully 80 per cent of the furniture produced in the state is of the cheaper grade.

The furniture industry, as considered in this report, includes, in addition to high and low grade parlor and bedroom furniture, cabinets, chests, cots, couches, kitchen cabinets and similar articles.

Furniture woods as a whole should be hard and strong, above all, and for most purposes should have an attractive grain.

In the manufacture of high grade furniture, Eastern oak,

red birch, Eastern maple, mahogany, Siberian oak, Oregon oak, Oregon ash and Oregon maple are the principal woods used. For the cheaper bedroom and mission furniture and kitchen tables, Douglas fir is the most largely used. Western red cedar, Western hemlock, Black cottonwood and Sitka spruce are best for drawer bottoms, shelves and backs of dressers, bookcases and cabinets.

TABLE NO. 8—FURNITURE.

SPECIES.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.		GROWN.
			Average.	Maximum.	
Douglas Fir	4,682,200	47.50	$23.92	$35.00	Oregon.
Oregon Maple	2,384,300	24.19	32.08	35.00	Oregon.
Western Hemlock	500,000	5.08	12.00	12.00	Oregon.
Oregon Oak	362,000	3.68	40.00	65.00	Oregon.
Red Alder	345,500	3.51	28.00	28.00	Oregon.
Western Yellow Pine	238,000	2.42	27.00	35.00	Oregon.
Oregon Ash	158,300	1.61	37.59	60.00	Oregon.
Black Cottonwood	148,800	1.51	11.43	12.75	Oregon.
Sitka Spruce	141,500	1.44	23.33	30.00	Oregon.
Myrtle	12,000	.13	70.00	75.00	Oregon.
Western Red Cedar	8,250	.09	35.50	40.00	Oregon.
Tamarack	4,000	.04	30.00	30.00	Oregon.
Port Orford Cedar	2,150	.03	60.00	60.00	Oregon.
Total of Oregon woods	8,987,000	91.23			
Eastern Maple	32,000	.321	$76.50	$81.00	East.
Eastern Oak	9,600	.092	129.25	170.00	East.
Redwood	2,000	.02	70.00	70.00	California.
Red Birch	2,000	.02	75.00	75.00	East.
Black Walnut	400	.004	240.00	240.00	East.
Hickory	350	.004	110.00	110.00	East.
Total other U. S. woods	46,350	.461			
Siberian Oak (plain)	720,500	7.31	$62.07	$68.00	Siberia & Japan
Siberian Oak (quart'd)	93.500	.94	76.66	90.00	Siberia & Japan
Mahogany (African)	4,000	.04	160.00	160.00	Africa.
Mahogany	1,000	.01	260.00	260.00	Honduras..
Mahogany (P. I.)	600	.006	140.00	140.00	Philippines.
Circassian Walnut	300	.003	350.00	350.00	Russia.
Total of foreign woods	819,900	8.309			
Grand Totals	8,853,250	100.00			

Much of the Oregon maple is stamped to resemble quartered oak or else stained to imitate mahogany. Frequently Douglas fir is stamped to resemble quartered oak. Most of the red alder is manufactured into chairs, because it turns well, is hard, even-grained, takes a fine polish and makes a good imitation of mahogany.

It is worthy of mention that since Siberian oak has been imported in the log and sawed in Portland, its use has greatly increased, and it is rapidly taking the place of Eastern oak.

Furniture stock is all purchased in the form of dry, rough lumber or, in case of high priced woods, in very thin veneers. Veneers are most frequently made of Eastern oak, Eastern maple, Black

and Circassian walnut and mahogany, and vary in thickness from one-thirty-second to one-eighth of an inch. The number of square feet of hardwood veeners annually consumed is as follows: Eastern maple, 350,000; Eastern oak, 350,000; African mahogany, 100,000, and Circassian walnut, 100,000.

The waste in furniture manufacture averages approximately 15 per cent, but has been reduced in some cases to 5 per cent. The furniture is practically all consumed locally, although some is shipped to Washington, California, Idaho and Alaska.

EXCELSIOR.

The excelsior mills of the state consume 5,400 cords or 4,320,000 feet B. M. of cottonwood annually. The excelsior industry, although of little importance, because of the limited amount of material consumed, is exceedingly unique, since it often makes possible the use of waste material. The waste referred to occurs in the form of cores of veneer logs.

Although cottonwood is the only species used for excelsior in this state, the white fir and spruce are sometimes substituted elsewhere. Cottonwood is preferred because it is cheap and easily worked.

TABLE NO. 9—EXCELSIOR.

SPECIES.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST PER CORD.		GROWN.
			Average.	Maximum.	
Black Cottonwood.....	4,320,000	100.00	$4.50	$5.50	Oregon.
TOTAL.....	4,320,000	100.00			

Wood suitable for excelsior manufacture should be soft, long fibred, straight grained and free from pitch and resin.

The material usually reaches the excelsior mill in the form of cord wood, six inches in diameter and four and one-half feet long. After thorough air seasoning it is cut into 18-inch bolts and is then ready for manufacture. The method consists of shredding the bolts with a comb-like knife. The thickness of the shreds is gauged by the amount of feed given to each stroke of the knife. The excelsior is then baled and ready for shipment. The waste is estimated at 10 to 12 per cent. This product is all consumed in the Coast states.

BASKETS AND VENEERS.

Since a very large portion of the wood manufactured into veneer is consumed in the manufacture of baskets, the two industries are so closely related that they are here combined. The manufacture of baskets and veneers is one of the less important industries, but an industry which will undoubtedly grow considerably as the vast agricultural resources of Oregon are developed.

Fruit, berry and hop baskets and coffee drums are the principal forms produced, although various types of baskets for minor uses are manufactured. Woods suitable for basket and veneer manufacture should be cheap, tough, easily bent, readily cut and free from splitting in drying. Lack of resin, weight and odor is also very frequently advantageous.

TABLE NO. 10—BASKETS AND VENEERS.

SPECIES.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.		GROWN.
			Average.	Maximum	
Douglas Fir	1,602,500	51.66	*		Oregon.
Sitka Spruce	800,000	25.79	$30.00	$30.00	Oregon.
Black Cottonwood	500,000	16.11	*		Oregon.
Noble Fir	200,000	6.44	*		Oregon.
TOTAL	3,102,500	100.00			

* Logs.

The small amount of veneer used outside of the basket business is consumed in the manufacture of built-up door and wall panels. For use in the manufacture of panels, in addition to the above requisites for basket material, the wood should be beautifully grained and capable of staining, polishing and gluing.

Sitka spruce, Noble fir and Black cottonwood are the woods generally employed in basket making. Cottonwood and Noble fir are also employed as substructure for built-up panels, the cottonwood being preferred. Douglas fir veneer is used almost exclusively for the exterior portion of the panels because of its beautiful grain when properly veneered, and because of the facility with which it stains. Hemlock might be substituted for the Douglas fir to very good advantage.

The raw material for the above purposes reaches the factory more commonly in the form of logs, but frequently spruce for making basket strips is purchased in plank form. The logs

are cut by rotating them against a knife which peels off a perimetrical layer in the form of a continuous sheet, having a width equal to the length of the log. This sheet is automatically cut into sizes suitable for facile handling. Before Douglas fir logs can be veneered they must be steamed for two or three days in order to soften the fiber of the wood.

Baskets are produced entirely for local consumption, but the panels are very frequently shipped to points in Washington, Idaho and California. Later on there will undoubtedly be a wide demand for built-up panels in the East.

HANDLES.

Oregon is well represented in the handle industry because of the presence in the state of several woods well adapted to such use. The industry includes the manufacture of pick, ax, tool and broom handles and insulator pins, tent stakes and toggles.

From the standpoint of material consumed, this is one of the minor industries. However, it is important in that it depends entirely upon local woods for its raw material.

Woods suitable for handles must be hard, strong, tough and resilient. Oregon oak and Oregon ash are excellent woods for pick and ax handles. Red alder is the best wood for broom handles, because it turns well, is hard and takes a fine polish. Douglas fir and Oregon maple are sometimes substituted for alder in the manufacture of broom handles.

TABLE NO. 11—HANDLES.

SPECIES.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.		GROWN.
			Average.	Maximum	
Oregon Oak	1,320,000	71.19	$30.00	$40.00	Oregon.
Douglas Fir	247,200	13.34	31.00	42.00	Oregon.
Oregon Ash	240,000	12.94	†		Oregon.
Oregon Maple	40,000	2.15	†		Oregon.
Red Alder	7,200	.38	42.00	42.00	Oregon.
TOTAL	1,854,400	100.00			

† Cordwood.

The raw material for handle manufacture, which reaches the factory in cord wood, log and lumber form, is usually consumed green, and the products seasoned after manufacture. Second growth oak and ash are preferred because their more rapid growth makes the wood stronger and less brittle than old growth

material. The market for Oregon handles is confined to the Coast states and Alaska.

FIXTURES.

This division includes store, office, bar and church fixtures. Although there is no great amount of wood used for this purpose, the construction of fixtures is of particular interest because of the high cost and large variety of the woods consumed. The woods are nearly all chosen for their beautiful grain and excellent finish, except Sitka spruce, Western red cedar and redwood, which are used for shelving, drawer bottoms and cores for veneered portions of the fixtures.

The large number of imported woods is particularly noteworthy. Siberian oak is rapidly taking the place of the Eastern oak for this use, owing to the fact that a Portland mill is now importing Siberian oak logs from the Orient and reducing them to lumber here. Douglas fir and Western hemlock are the best local woods for this purpose, because of their attractive grain and cheapness. For the carving of church fixtures yellow poplar and redwood are commonly used, although Port Orford or yellow cedar might be substituted.

TABLE NO. 12—FIXTURES.

SPECIES.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.		GROWN.
			Average.	Maximum.	
Douglas Fir	537,000	33.87	$25.25	$30.00	Oregon.
Sitka Spruce	412,000	25.99	29.68	40.00	Oregon.
Western Red Cedar	205,000	12.93	19.80	35.00	Oregon.
Western Hemlock	103,000	6.49	17.00	22.00	Oregon.
Oregon Maple	19,000	1.19	24.00	30.00	Oregon.
Oregon Ash	12,500	.78	36.00	40.00	Oregon.
Oregon Oak	3,000	.19	30.00	40.00	Oregon.
Myrtle	500	.03	150.00	150.00	Oregon.
Port Orford Cedar	200	.01	70.00	70.00	Oregon.
Total of Oregon woods.	1 292,200	81.48			
Eastern Oak (plain)	73,500	4.64	$125.00	$150.00	East.
Eastern Oak (quart'd)	46,000	2.91	141.50	170.00	East.
Redwood	9,000	.56	50.00	50.00	California.
Eastern Ash	5,500	.34	100.00	120.00	East.
Yellow Poplar	2,000	.12	115.00	130.00	East.
Black Walnut	1,500	.09	350.00	400.00	East.
Total of other U. S. woods	137,500	8.66			
Siberian Oak (plain)	95,000	5.99	$80.50	$95.00	Japan & Siberia
Mahogany (So. Amer.)	31,000	1.97	170.00	175.00	South America.
Mahogany (P. I.)	23,000	1.46	115.00	120.00	Philippines.
Mahogany (Mex.)	3,000	.18	165.00	165.00	Mexico.
Siberian Oak (qtr'd.)	2,000	.13	90.00	100.00	Japan & Siberia
Mahogany (African)	2,000	.13	265.50	300.00	Africa.
Total of foreign woods.	156,000	9.86			
Grand Total	1,585,700	100.00			

Most of the material to be used in the manufacture of fixtures is purchased in the form of rough, dry, one-inch lumber and to a very limited extent in the form of thin veneer. Fixtures are in practically all cases manufactured to meet local orders.

WOOD DISTILLATION.

Although the amount of material consumed for distillation purposes is very small, this industry is worthy of special remark, since it relies entirely on sawmill waste as a source for its raw material. Through this method of closer utilization, nearly a million board feet of Douglas fir which would otherwise go into the burners, is annually saved.

Douglas fir is the only wood employed and, since the pitchy pieces are desired, the material is usually selected from the conveyors at the sawmill and such pieces as show a proper amount of pitch are picked out.

TABLE NO. 13—WOOD DISTILLATION.

SPECIES.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST PER CORD.		GROWN.
			Average.	Maximum.	
Douglas Fir.....	800,000	100.00	$3.00	$3.50	Oregon.
TOTAL.....	800,000	100.00			

These pitchy sawmill scraps, before being placed in the retort for distillation, are reduced to pieces about two inches square and four inches long. The method of distillation is a combination of the steam and destructive processes. The turpentine is first removed by admitting live steam into the retort and raising the temperature slowly until at the end of seven hours it reaches 325 degrees F., after which most of the turpentine has been obtained. Dry heat is then applied slowly until at the end of thirty-two hours it has reached 832 degrees F. During this dry heat process, pyroligneous acid and the various tar oils contained in the wood, are driven off, leaving pure charcoal in the retort.

It is to be regretted that the local market for the products obtained is so limited that any future growth of this industry and subsequent increase in the saving of waste material is dependent upon the future demand for the products.

PATTERNS.

Although only a very small amount of wood is used for this purpose, pattern making is of interest because of the character of the wood desired.

TABLE NO. 14—PATTERNS.

SPECIES.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.		GROWN.
			Average.	Maximum.	
Western White Pine...	5,000	1.32	$50.00	$50.00	Oregon.
Sugar Pine.....	3,000	.79	65.00	75.00	Oregon.
Western Red Cedar....	300	.08	50.00	50.00	Oregon.
Total of Oregon woods.	8,300	2.19			
Redwood.....	366,000	96.56	$50.35	$70.00	California.
Eastern Maple.....	2,000	.53	75.00	75.00	East.
Total of other U. S. woods.....	368,000	97.09			
Spanish Cedar.....	2,200	.58	$172.50	$220.00	Mexico.
Mahogany.....	350	.09	225.00	300.00	Honduras.
Teak.....	200	.05	150.00	150.00	India.
Total of foreign woods..	2,750	.72			
Grand Total.....	379,050	100.00			

Pattern wood should be homogeneous, fine grained and compact, yet easily worked, and in addition should resist deformation under varying atmospheric conditions. California redwood is most used because it best fulfills these requirements, and in addition is moderately cheap. Port Orford cedar might well be used for this purpose.

Of the more expensive woods, Spanish cedar, Eastern maple, mahogany and teak are commonly used, but usually patterns made from such woods are very small and of a permanent nature. Redwood is often substituted by red cedar and sugar pine in making patterns of a temporary character.

Pattern wood is usually purchased thoroughly dried in the form of rough or dressed plank, one to four inches thick. The waste is estimated at from 15 to 25 per cent. Patterns are all cut for local trade, many of them being made by iron works entirely for their own use.

SADDLES AND STIRRUPS.

Although the saddle and stirrup industry is one of the minor wood-using industries, it relies entirely upon local woods for its raw material, and it is of interest for this reason.

Wood suitable for the manufacture of saddle trees should be hard and strong, but easily worked. Douglas fir meets these requirements fairly well and, in addition, is very cheap. Oregon maple is the only substitute for the Douglas fir for such use. Wood serviceable for pack saddles, in addition to the above requisites, should resist checking and warping under adverse conditions, and for this reason red alder and black cottonwood are preferred. Oregon ash is sometimes substituted because of its greater strength. For stirrups Oregon oak is the only wood utilized. Its superior qualities for this purpose are its hardness, strength and flexibility. Second growth material is preferred.

TABLE NO. 15—SADDLES AND STIRRUPS.

SPECIES.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.		GROWN.
			Average.	Maximum.	
Douglas Fir	130,500	62.59	$15.00	$15.00	Oregon.
Oregon Oak	50,000	23.99	40.00	40.00	Oregon.
Black Cottonwood	9,000	4.33	21.00	21.00	Oregon.
Red Alder	8,000	3.85	27.00	27.00	Oregon.
Oregon Maple	6,000	2.88	28.00	28.00	Oregon.
Oregon Ash	5,000	2.36	28.00	28.00	Oregon.
TOTAL	208,500	100.00			

The wood used for these purposes comes to the factory in the form of thoroughly seasoned rough lumber. The saddle tree forms are first sawed out roughly on a jig saw and then shaped by hand. The stirrup strips are run through a shaper which leaves them thicker in the center than at the ends. They are then steamed and bent into proper shape.

The waste in the manufacture of these products amounts to about 30 per cent. Oregon saddles and stirrups are used not only locally, but throughout the Pacific Coast, British Columbia and the Middle West.

VEHICLES.

This industry, which includes the manufacture and repair of automobiles, wagons, carriages, farm machinery, farm implements, etc., depends very largely upon Eastern hardwoods for its raw material. The local woods consumed in an amount worthy of mention are Sitka spruce, Douglas fir, Oregon oak and Oregon ash, and these more because of their cheapness than any superiority of texture.

Although the amount of wood used for this purpose is relatively small, the high cost of material used gives considerable weight to its importance. It is very probable that the figures of consumption of vehicle material are very low, since many of the wagon repair shops failed to report.

TABLE NO. 16—VEHICLES.

SPECIES.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.		GROWN.
			Average.	Maximum.	
Douglas Fir	27,000	13.63	$43.57	$50.00	Oregon.
Sitka Spruce	24,000	12.11	47.85	50.00	Oregon.
Oregon Oak	12,000	6.06	40.00	40.00	Oregon.
Oregon Ash	10,000	5.05	40.00	40.00	Oregon.
Western Yellow Pine	1,000	.51	30.00	40.00	Oregon.
Total of Oregon woods	74,000	37.36			
Eastern Oak	58,300	29.41	$135.83	$150.00	East.
Hickory	31,000	15.64	166.92	180.00	East.
Yellow Poplar	21,200	10.69	119.28	130.00	East.
Eastern Ash	11,500	5.80	142.00	150.00	East.
Red Birch	2,000	1.00	120.00	120.00	East.
Rock Elm	200	.10	150.00	150.00	East.
Total of other U. S. woods	124,200	62.64			
Grand Total	198,200	100.00			

Eastern oak, ash and hickory are the most important woods and their value lies in their strength, toughness, resilience and hardness. Spokes, rims, bolsters, frames, reaches, etc., are usually made of these woods, while the bodies of automobiles and high grade vehicles are made of yellow poplar (white wood). It would seem that the local cottonwood or spruce might well be substituted for the yellow poplar.

Oregon oak and ash are sometimes used for repairing heavy trucks, but they are considered undesirable because of the difficulty of working them.

The local softwoods are desirable for bodies and bottoms of wagons, and sometimes substitute Eastern woods for tops and panels of delivery wagons.

Eastern hardwoods are purchased in the form of thoroughly air-seasoned rough lumber in varying thicknesses from one to four inches. Local softwoods are purchased in the form of surfaced lumber. The manufacture and repair of vehicles are all done to meet local demands.

PULLEYS.

Manufacturers of split and solid pulleys rely entirely upon local woods for raw material.

TABLE NO. 17—PULLEYS.

SPECIES.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.		GROWN.
			Average.	Maximum	
Sitka Spruce	60,000	61.54	$16.50	$16.50	Oregon.
Douglas Fir	20,000	20.52	12.50	12.50	Oregon.
Oregon Maple	12,000	12.30	20.00	28.00	Oregon.
Red Alder	5,500	5.64	20.00	25.00	Oregon.
TOTAL	97,500	100.00			

Pulley wood to be used for the rims should be light, strong, fairly hard and adaptable to gluing. Sitka spruce is well suited to such use and finds exclusive employment in Oregon. Cottonwood, however, is often substituted for spruce in Washington because of its cheapness. For the spokes and arms of the pulleys Douglas fir is preferred because of its greater strength. The hardness and even texture of Oregon maple and alder recommend them for bushings and solid pulleys.

The manufacture consists simply of sawing out segment layers and fastening them together by gluing and nailing. A special cement-coated nail is used, which is practically inextractable. Rough kiln-dried shop lumber is employed.

The waste is estimated at 10 per cent.

The pulleys are consumed locally with the exception of a few which are shipped to California.

TABLE NO. 18—MISCELLANEOUS.

SPECIES.	ANNUAL CONSUMPTION FEET B. M.	COST OF GRADES USED PER FEET B. M.		USED MOSTLY FOR.	GROWN.
		Average.	Maximum.		
Western Red Cedar....	265,500	$18.00	$25.00	Fencing.	Oregon.
Sitka Spruce.....	194,000	35.00	40.00	Trunks.	Oregon.
Douglas Fir.....	120,700	20.00	40.00	Elevators.	Oregon.
Port Orford Cedar.....	6,000	18.00	40.00	Turnery.	Oregon.
Western White Pine...	5,000	18.00	18.00	Fruit Driers.	Oregon.
Western Yellow Pine...	4,000	18.00	18.00	Fruit Driers.	Oregon.
Myrtle.....	2,200	40.00	40.00	Turnery.	Oregon.
Oregon Maple.....	300	50.00	50.00	Musical Instruments.	Oregon.
Total of Oregon woods.	597,700				
Redwood.....	40,000	$36.00	$36.00	Incubators.	California.
Basswood.....	25,000	70.00	70.00	Cigar Boxes.	Central States.
American Elm.....	10,000	80.00	80.00	Trunks.	Central States.
English Willow.....	2,000	200.00	200.00	Artificial Lbs	East.
Eastern Oak.....	500	100.00	100.00	Trunks.	Central States.
Total of other U. S. woods.....	77,500				
Spanish Cedar.....	18,600	$130.00	$170.00	Cigar Boxes.	South America.
Camphorwood.....	400	165.00	165.00	Musical Instruments.	Borneo.
Total of Foreign woods.	19,000				
GRAND TOTAL.....	694,200				

SUMMARY OF CONSUMPTION BY SPECIES.

Sitka spruce is used in a larger amount than any other wood, but 40 per cent of the spruce was made into pulp and 30 per cent into boxes, leaving a very small amount actually consumed for the various other products. The amount of Western hemlock consumed is also proportionately large because nearly 75 per cent of all of the hemlock reported was used by the pulp industry. Douglas fir is, therefore, the most widely and universally used of all species in the state. This is well brought out by reference to the individual discussion of each species and the list of uses mentioned later in this publication.

The greater use of Noble fir is handicapped by its inaccessibility and, along with Western white pine, Black cottonwood, Western red cedar and White fir, the consumption of this species is restricted by its limited occurrence.

Western yellow pine, which ranks fifth from the standpoint of consumption, would undoubtedly be more used if the area of its existence were more thickly populated. The value of Port Orford cedar and its confined occurrence retard its extensive use; for the latter reason the use of sugar pine is greatly restricted.

Considering the size of the trees and the sparse growth, Oregon oak and Oregon maple both make an excellent showing, since they outrank all other hardwoods utilized, Siberian oak being their nearest competitor. Oregon ash, which is next, is closely followed by Eastern oak and Philippine mahogany.

Red alder has many admirable properties and its limited consumption can be entirely attributed to the small amount of available timber. Myrtle cannot be considered a commercial tree, since it is so sparse that its use is practically confined to the manufacture of novelties.

TABLE NO. 19—SUMMARY OF CONSUMPTION BY SPECIES.

SPECIES.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	GROWN.
Sitka Spruce	90,501,600	30.51	Oregon.
Douglas Fir	72,435,100	24.42	Oregon.
Western Hemlock	62,940,400	21.22	Oregon.
Noble Fir	13,307,900	4.49	Oregon.
Western White Pine	10,632,000	3.59	Oregon.
Black Cottonwood	10,511,000	3.51	Oregon.
Western Red Cedar	9,250,550	3.12	Oregon.
White Fir	5,614,000	1.89	Oregon.
Western Yellow Pine	5,252,000	1.77	Oregon.
Port Orford Cedar	4,475,750	1.51	Oregon.
Sugar Pine	4,061,000	1.37	Oregon.
Oregon Maple	2,481,600	.84	Oregon.
Oregon Oak	1,988,000	.67	Oregon.
Oregon Ash	445,800	.15	Oregon.
Red Alder	367,200	.12	Oregon.
Myrtle	20,200	.006	Oregon.
Tamarack	4,000	.001	Oregon.
Total of Oregon woods	294,288,100	99.187	
Redwood	567,000	.19	California.
Eastern Oak (plain)	250,000	.08	Central States.
Eastern Oak (quartered)	90,000	.03	Central States.
Eastern Maple	35,000	.01	Central States.
Hickory	31,350	.01	Central States.
Basswood	25,000	.009	Central States.
Yellow Poplar	24,800	.008	So.Appalachian
Eastern Ash	21,000	.007	Central States.
American Elm	10,000	.004	Central States.
Red Birch	5,500	.002	Michigan.
Red Gum	5,000	.001	So.Appalachian
English Willow	2,000	.0008	East.
Black Walnut	1,900	.0007	Central States.
Rock Elm	200	.00004	Central States.
Total of other U. S. woods	1,068,750	.35254	
Siberian Oak (plain)	890,500	.30	Japan & Siberia
Philippine Mahogany	279,600	.09	Philippine Isls.
Siberian Oak (quartered)	115,500	.03	Japan & Siberia
African Mahogany	83,750	.02	Africa
South American Mahogany	33,450	.01	So. Am. & Hon.
Spanish Cedar	21,100	.007	South America
Ironbark	4,750	.001	Australia
Mexican Mahogany	3,000	.001	Mexico
Teak	1,200	.0005	India
Rosewood	1,000	.0004	Australia
Rungus	500	.0003	So. America
Camphorwood	400	.0002	Borneo
Circassian Walnut	300	.00006	Russia
Total of Foreign woods	1,435,050	.46046	
GRAND TOTAL	296,791,900	100.00	

The figures for tamarack,which show the least consumption of all of the Oregon woods, are not considered accurate since several of the Eastern Oregon manufacturers failed to send in reports.

It is interesting to note what a very small per cent of the woods annually consumed is obtained outside of the state. This clearly shows how well Oregon is equipped to meet her wood demands, and that although her hardwoods are somewhat inferior and scattering, they are highly usable, and will increase in value as the Eastern supply is exhausted. It might be well to mention here that the State of Maryland is forced to bring in 80 per cent of the lumber used by her wood-using industries; Massachusetts, 70 per cent and Wisconsin 50 per cent.

SITKA SPRUCE.

Sitka or Tideland spruce (Picea sitchensis), which is confined to the western part of the state, occurs chiefly along the coast within a few miles of tidewater. The trees are tall and generally straight, having long boles with a moderate taper. The trees ordinarily range in size from three to six feet in diameter, and 80 to 190 feet in height.

TABLE NO 20—SITKA SPRUCE.

INDUSTRY.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL	COST OF GRADES USED PER M. FEET B. M.	
			Average.	Maximum.
Boxes	38,550,000	42.61	$11.93	$20.00
Pulp	28,513,600	31.51	9.00	†
Sash and Doors	20,557,000	22.71	18.00	33.00
Interior Work	1,089,000	1.21	36.88	50.00
Baskets and Veneers	800,000	.89	30.00	30.00
Fixtures	412,000	.46	29.68	40.00
Miscellaneous	194,000	.21	35.00	40.00
Furniture	141,500	.15	23.33	30.00
Boats	120,500	.13	48.75	55.00
Pulleys	60,000	.06	16.50	16.50
Cooperage	40,000	.04	30.00	30.00
Vehicles	24,000	.02	47.85	50.00
TOTAL	90,501,600	100.00		

† Cordwood.

The wood is reddish white, soft, even-grained, long-fibered, easily worked, odorless, tasteless, non-resinous, very strong (for its weight), cheap, flexible, tough, easily nailed and resonant. It does not warp or split, and therefore makes excellent core stock for veneered articles, drawer bottoms and panels. In addition, it holds nails well and readily takes paints. Its chief assets are strength, lightness and lack of color and odor. For

these reasons it is of great value in box and cooperage manufacture, especially where foodstuffs are to be encased. Its lightness, ease of working and painting are excellent qualities for sash and door stock, bevel siding, interior finish and shelving. Spruce ranks with cottonwood as the best pulpwood in the state, and is the only wood known to be used for piano sounding boards in the Northwest.

One of the bad features of spruce is that it decays more readily than many of the other species.

It is fortunate that a sufficient quantity of this excellent wood is available in the state to meet the immediate demand.

DOUGLAS FIR.

Douglas fir (pseudotsuga taxifolia), the most abundant and universally applied wood in the state, forms the major part of the dense stand of timber found west of the Cascade Mountains. Its range varies in altitude from the level of the sea to 6,000 feet elevation. Aside from the Sequoias of California, Douglas fir trees are the largest in the world.* The tree reaches its

TABLE NO. 21—DOUGLAS FIR.

INDUSTRY.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.	
			Average.	Maximum.
Cooperage	20,430,000	28.21	$25.00	$28.00
Interior Work	18,757,000	25.89	22.00	30.00
Boats	14,265,500	19.69	30.71	45.00
Sash and Doors	9,161,500	12.65	20.10	25.00
Furniture	4,682,200	6.47	23.92	35.00
Boxes	1,650,000	2.27	12.66	18.00
Baskets and Veneers	1,602,500	2.22	*	
Distillation	800,000	1.10	†	
Fixtures	537,000	.74	25.25	30.00
Handles	247,200	.34	31.00	42.00
Saddles	130,500	.18	15.00	15.00
Miscellaneous	120,700	.16	20.00	40.00
Vehicles	27,000	.04	43.57	50.00
Pulleys	20,000	.03	12.50	12.50
Columns	4,000	.01	25.00	25.00
TOTAL	72,435,100	100.00		

* Logs. † Cordwood.

greatest development in British Columbia, but much of the fir timber in Oregon approaches in character that found farther north. Owing to the size of the trees, which are ordinarily 3 to 6 feet in diameter, and 150 to 225 feet high, the logs contain a large amount of clear lumber. It is worthy of mention that Douglas fir formed 83.2 per cent of the total sawmill cut of the state in 1909.

* Occasional trees of Sitka spruce are larger.

The wood varies greatly in character and color from a fairly soft, fine-grained straw yellow in the old, slow-growth trees, to a hard, coarse-grained red-brown in the fast-growing timber. For this reason red fir and yellow fir were long considered distinct species by the trade. Investigation, however, has shown beyond a doubt that they are not distinct species, since both kinds of wood are often found in the same tree.

The wood is strong, tough, resilient, straight-grained, resinous, comparatively cheap and fairly light. In addition, it has a most attractive grain when cut tangentially, stains well, holds nails firmly, is practically impervious to water, and quite durable. It is frequently stamped to imitate quartered oak, and is also used for the cores of veneered articles. One of its best features is the great length of timbers which the enormous height of the trees affords. Its beauty, strength, size, cheapness and abundance are its chief assets. In strength it is probably equal to the Longleaf pine of the Southeast, which is considered the strongest softwood in the United States. The presence of pitch and its tendency to split are purported to be its only bad characteristics. Its beautiful grain, and, therefore, wide use for interior work, is particularly noteworthy.

WESTERN HEMLOCK.

Western hemlock (Tsuga heterophylla) commonly grows in mixture with Douglas fir, Western red cedar and other species throughout the western part of the state, from sea level to an altitude of five or six thousand feet, except in the Willamette Valley, where it rarely occurs below 1,500 feet. The trees of Western hemlock are seldom found in pure stands, but prefer the association of other species, in whose company they attain a considerable size, ordinarily two to five feet in diameter and 125 to 160 feet high.

TABLE NO. 22—WESTERN HEMLOCK.

INDUSTRY.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.	
			Average.	Maximum.
Pulp	47,162,400	74.94	$ 5.00	†
Boxes	11,800,000	18.75	12.03	$18.00
Sash and Doors	2,950,000	4.69	12.00	12.00
Furniture	500,000	.79	12.00	12.00
Interior Work	425,000	.68	25.00	25.00
Fixtures	103,000	.15	17.00	22.00
TOTAL	62,940,400	100.00		

† Cordwood.

It is unfortunate that some of the logs cut from this tree are not of better quality. The defective logs contain checks, shakes and small black knots, which make the quantity of clear lumber obtained from them very small.

Western hemlock has long suffered from an atrocious prejudice because its name immediately recalls the inferior qualities of its sister tree of the East. The wood of Western hemlock, however, is of excellent character, but, because of the similarity in name, the Western hemlock manufacturers are frequently forced to sell their product under an assumed name, so that Eastern and Middle West purchasers will not be prejudiced against it. This prejudice is rapidly disappearing, however, since at the present time purchasers are willingly accepting shipments of Douglas fir known to contain 10 per cent of Western hemlock, and some consumers even prefer it to the fir and order it exclusively.

The wood is fairly hard, straight-grained and has a decided tinge of reddish brown. In addition, it is cheap, non-resinous, fairly light, odorless (when dry), easily nailed and has a beautiful grain. It takes paints and stains well, holds nails firmly and is well adapted to use as core stock for veneered products. Its chief assets are its cheapness, beauty of grain and lack of resin and odor.

The wood finishes smoothly and is often preferred to other species for casing, rustic, base and similar forms. Its lack of pitch, in addition to its attractive grain, frequently gives it preference to Douglas fir. It is an admirable box lumber because of its whiteness, toughness and lack of taste and odor.

Although not as strong and hard as Douglas fir, it is well adapted to structural uses, and is often substituted for fir in the manufacture of flooring, for which use it is said to give excellent satisfaction. Its tendency to warp in kiln drying and when exposed to the elements are its worst features.

NOBLE FIR.

Noble fir (Abies nobilis) or larch,* as it is commonly and improperly called, is of great commercial value, and although its occurrence is not wide, there are several large stands of this species in the state, containing a vast amount of choice timber. Noble fir occurs chiefly on the tops of the mountains along both

* The true larches are the tamaracks.

sides of the Cascades, from the Columbia River to the California line, but more frequently on the west slope. It also occurs to some extent on both slopes of the Coast Range. Its altitudinal occurrence varies from 2,000 to 6,000 feet, which fact accounts largely for the limited amount of this species now being operated. The trees are of magnificent type, tall and straight, with symmetrical trunks and crowns, which give the trees a very stately appearance. The long, clear boles yield a high percentage of clear lumber. This tree's most frequent dimensions are: 140 to 200 feet in height, and 30 to 60 inches in diameter.

TABLE NO. 23—NOBLE FIR.

INDUSTRY.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL	COST OF GRADES USED PER M. FEET B. M.	
			Average.	Maximum.
Pulp	6,654,400	50.00	$7.00	‡
Boxes	6,453,500	48.50	10.12	$14.00
Baskets and Veneers	200,000	1.50	*	
TOTAL	13,307,900	100.00		

* Logs. ‡ Per cord.

The wood is a pale brownish gray, frequently streaked with a reddish tinge. It is heavier and finer-grained than any of the other "true firs," but not as heavy as Douglas fir and Western hemlock. In addition, the wood is moderately strong, odorless, tasteless, non-resinous, soft enough to be easily worked, and is so similar to Western hemlock that it is almost impossible to distinguish between the two when thoroughly dry. It does not check and warp in drying, and is therefore desirable for sash and door stock, planing mill products and general shop work. In fact, it is well adapted to all of the uses of Western hemlock.

SUGAR AND WESTERN WHITE PINE.

Sugar pine (Pinus lambertiana) and White pine (Pinus monticola), owing to their limited occurrence, are not largely used in this state. These two trees are treated in conjunction in this report, because of the similarity of the wood produced by each.

The commercial range of sugar pine is confined to Josephine, Jackson and Klamath Counties, while the white pine is found scattered on both sides of the Cascade Range and east to the Blue Mountains. Sugar pine occurs at from 2,000 to 5,000 feet elevation, while white pine is frequently found as high as 7,000 feet. Mature sugar pine trees vary from four to seven feet in

diameter and 160 to 180 feet in height. The white pine is very much smaller, varying from two to three and one-half feet in diameter and from 90 to 140 feet high.

The wood of both trees is a very pale reddish yellow, soft, very light, fairly tough and easily worked. In addition, it nails readily, does not split, and takes paint exceptionally well.

TABLE NO. 24—SUGAR AND WESTERN WHITE PINE.

INDUSTRY.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.	
			Average.	Maximum.
Boxes	14,575,000	99.19	$12.00	$15.00
Sash and Doors	75,000	.51	18.00	18.00
Interior Work	29,000	.19	50.00	60.00
Patterns	8,000	.06	50.00	75.00
Miscellaneous	5,000	.04	18.00	18.00
Boats	1,000	.01	60.00	70.00
TOTAL	14,693,000	100.00		

The above properties give these two woods notable value for boxes, sash and door stock, patterns and shelving, for which purposes they are better suited than many of the woods used in greater amounts.

BLACK COTTONWOOD.

Black cottonwood (Populus trichocarpa) or Balm, as it is frequently known, is more abundant and reaches a larger size than any other broad-leafed species in the state. This tree occurs in thickets along the streams in the western and northern portion of the state. On the west slopes of the Cascades, where it reaches its best development, it occurs up to 3,000 feet, while in the eastern part of the state it rarely grows below 3,500 feet, and is found as high as 5,000 feet. This tree is the largest of American poplars, and occasionally grows five to six feet in diameter and 115 to 150 feet high, although more commonly it is three to four feet in diameter in the western part of the state, and two to three feet in the eastern part. The trees are nearly always straight, and because of the readiness with which the lateral branches are shed, a large per cent of clear wood is produced.

The wood is a grayish white, soft, odorless, tasteless, straight and even-grained, very light, long-fibered and readily nailed, glued and veneered. In addition, it resists shrinking, swelling, warping and splitting. Because of its softness, light color and long, straight fiber, it is particularly adapted to pulp and excel-

sior manufacture. Its color, lack of odor, lightness, cheapness and facility in nailing, fit it especially for box material. It is also employed largely for cores of built-up panels, drawer bottoms, shelving and like uses.

TABLE NO. 25—BLACK COTTONWOOD.

INDUSTRY.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.	
			Average.	Maximum.
Pulp	5,533,200	52.65	$ 6.50	†
Excelsior	4,320,000	41.11	5.00	†
Baskets and Veneers	500,000	4.75		
Furniture	148,800	1.41	11.43	$12.75
Saddles	9,000	.08	21.00	21.00
TOTAL	10,511,000	100.00		

† Cordwood.

It is remarkable that, regardless of the many excellent properties of black cottonwood and the rapidly diminishing supply, this wood is still very cheap.

WESTERN RED CEDAR.

Western red cedar (Thuja plicata) is found on both sides of the Coast Range, up to an altitude of 3,500 feet, but its greatest occurrence is on the Western slope of the Cascades, from two to five thousand feet elevation. The trees grow very large, ordinarily from three to eight feet in diameter, and sometimes ten to sixteen feet, tapering very rapidly for the first twenty-five or thirty feet. The height varies from 150 to 180 feet. The butts are very much swollen and decidedly corrugated for several feet above the ground, causing the "fallers" to cut very high stumps. These large stumps, however, are customarily cut up into shingle bolts.

TABLE NO. 26—WESTERN RED CEDAR.

INDUSTRY.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL	COST OF GRADES USED PER M. FEET B. M.	
			Average.	Maximum.
Sash and Doors	6,290,000	67.99	$18.00	$30.00
Interior Work	1,530,000	16.54	23.50	30.00
Caskets	470,000	5.09	16.50	19.00
Columns	300,000	3.25	25.00	25.00
Miscellaneous	265,500	2.88	18.00	25.00
Fixtures	205,000	2.21	19.80	35.00
Boats	166,500	1.79	38.00	50.00
Cooperage	15,000	.16	37.50	37.50
Furniture	8,250	.08	35.50	40.00
Patterns	300	.01	50.00	50.00
TOTAL	9,250,550	100.00		

The wood of the Western red cedar is distinctly brown, with a slight tinge of red, which usually disappears as the wood is seasoned. It is soft, brittle, straight-grained, very light, easily worked, very durable and aromatic. Because it is easily glued and retains its shape, it is an excellent wood for the substructure of built-up panels and veneered products; also for sashes, doors, caskets and the interior of cabinets. Cedar is preferred for the manufacture of ice cream tubs and similar articles because of its durability and affinity for paint. On account of the facility with which it works it is commonly employed in making patterns and turned columns. The aroma exuded by the cedar favors it for use in the manufacture of moth-proof drawers and chests.

It is to be regretted that this wood, with so many excellent characteristics, is lacking in strength.

WESTERN YELLOW PINE.

Western yellow pine (Pinus ponderosa) is found throughout the forested area of Eastern Oregon, occurring chiefly on the east slope of the Cascades and in the Blue Mountain region; also in Jackson, Klamath and Lake Counties.

This admirable forest tree is most frequently 125 to 140 feet high, and three to four feet in diameter. The trees are tall and straight with little taper and long clear boles.

TABLE NO. 27—WESTERN YELLOW PINE.

INDUSTRY.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.	
			Average.	Maximum.
Boxes	4,808,000	91.55	$12.57	$15.00
Furniture	238,000	4.54	27.00	35.00
Sash and Doors	125,000	2.39	21.50	28.00
Interior Work	76,000	1.44	30.00	45.00
Miscellaneous	4,000	.07	18.00	18.00
Vehicles	1,000	.01	25.00	25.00
TOTAL	5,252,000	100.00		

The wood varies in color from a distinct whitish yellow to a reddish yellow or brown. It is light, soft yet firm, strong, tough, resinous, holds nails well and does not split readily. The wood is frequently so soft and light that it is often sold as white pine for shop work. The average run of Western yellow pine, however, is harder, coarser, heavier and more resinous than either the Eastern or Western white pine.

PORT ORFORD CEDAR.

Port Orford cedar (Chamaecyparis lawsoniana) or Lawson cypress, as it is sometimes called, is one of the best woods grown in the state, and probably the least known. Its range in Oregon is practically confined to Coos and Curry Counties, where it grows rather abundantly from sea level to an altitude of about 5,000 feet. The trees are very large, varying from 125 to 180 feet in height, and three to six feet in diameter. Because of the excellent qualities of the wood, Port Orford cedar brings a very high price in the lumber market.

TABLE NO. 28—PORT ORFORD CEDAR.

INDUSTRY.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.	
			Average.	Maximum.
Sash and Doors	4,000,000	89.38	$17.00	$17.00
Matches	200,000	4.45	* *	
Boats	192,400	4.29	59.54	85.00
Interior Work	75,000	1.68	50.00	60.00
Miscellaneous	6,000	.14		
Furniture	2,150	.05	60.00	60.00
Fixtures	200	.01	70.00	70.00
TOTAL	4,475,750	100.00		

* * Bolts.

The wood is almost white, having a yellow tinge with a very slight trace of red. It is rather hard, straight, even-grained, tough, decidedly odorous and extremely durable. In addition, it works similarly to the finest white pine, and does not lose its shape after manufacture.

For sash and door stock, rowboat lumber and similar uses where a light, strong, durable and easily worked wood is desired, this cedar is second to none. Its straight grain and the facility with which it is worked gives this wood a high place among those used for match and pattern-making.

Because of the aroma exuded from the wood, it is highly recommended for use in the manufacture of moth-proof chests and drawers, and for this purpose is preferred to Western red cedar.

OREGON MAPLE.

Oregon maple (Acer macrophyllum), also known as Big Leaf and Broad Leaf Maple, is the only commercial maple of the Pacific Coast. The range of this species lies west of the Cascade Range, except along the Columbia River, where it extends east as far as the mouth of the Deschutes River. The trees are very

similar in shape to the Oregon oak, in that they have a short trunk and bushy crown. The height of the trees is commonly sixty to eighty feet, with diameters from twelve to thirty inches.

The Oregon maple is by far the most important hardwood of the state, and the wood is said to be comparable to the Eastern hard maple (Acer saccharum).

The wood is pale brown, fine-grained, very hard, tough and very strong. In addition, it turns nicely, takes an excellent polish, and, owing to its wavy grain, can be readily stained to imitate mahogany.

TABLE NO. 29—OREGON MAPLE.

INDUSTRY.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL	COST OF GRADES USED PER M. FEET B. M.	
			Average.	Maximum.
Furniture	2,384,300	96.08	$32.08	$35.00
Handles	40,000	1.62	†	
Interior Work	20,000	.81	28.00	32.00
Fixtures	19,000	.76	24.00	30.00
Pulleys	12,000	.48	20.00	28.00
Saddles	6,000	.24	28.00	28.00
Miscellaneous	300	.01	50.00	50.00
TOTAL	2,481,600	100.00		

† Cordwood.

This wood finds its best use in the manufacture of furniture, and for such work it is highly commendable. Oregon maple is particularly adapted to the manufacture of pulleys, broom handles and similar products, requiring a hard, strong, stiff wood, which may be easily turned and polished.

It is regrettable that this very important hardwood is not more abundant, since its use is greatly handicapped because of its scattering occurrence.

OREGON OAK.

Oregon oak (Quercus garryana) is a very important wood, because of its adaptability to use in substituting the white and red oaks imported from the East at a very high cost. Its range is practically confined to the drainage areas of the Willamette, Umpqua and Rogue Rivers, below 3,000 feet. It also occurs to a limited extent on the northeast slope of the Cascades.

This is the largest species of oak in the state, and is, in fact, the only native oak of commercial significance. The trees have a rather short trunk, which is nearly always topped by a broad, bushy crown. The diameters range from 18 to 36 inches, and the height from 50 to 80 feet.

The wood is a yellowish brown, very hard, rather coarse-grained, very strong, tough, durable, veneers readily, is bendable, resilient and impervious to water and alcohol. In addition, it has a very attractive grain, not unlike the Eastern white oak, takes an excellent polish and holds nails firmly. Its tendency to check in drying, the difficulty with which it is worked, owing to its flintiness, its limited occurrence and the small amount of clear lumber obtained from the logs, are the principal factors retarding its use. It has, however, been successfully used in competition with Eastern oak in the manufacture of furniture, fixtures and boats, but is the only oak used by Oregon cooperage, handle and stirrup manufacturers. Its ability to compete with Eastern oak lies more in its cheapness than any superior or equal qualities.

TABLE NO. 30—OREGON OAK.

INDUSTRY.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.	
			Average.	Maximum.
Handles	1,320,000	66.39	$30.00	$40.00
Furniture	362,000	18.21	40.00	65.00
Cooperage	200,000	10.07	§	
Saddles and Stirrups	50,000	2.52	40.00	40.00
Boats	31,000	1.56	50.50	70.00
Vehicles	12,000	.60	40.00	40.00
Interior Work	10,000	.50	30.00	35.00
Fixtures	3,000	.15	30.00	40.00
TOTAL	1,988,000	100.00		

§ Staves.

The old, slow-growth Oregon oak is frequently brashy, but this feature is not noticed in the younger trees. Owing to its hardness it is particularly adapted to use where the wood is subjected to extreme mechanical wear.

OREGON ASH.

Oregon ash (Fraxinus oregona) is an excellent substitute for Eastern ash. Although the tree is not found in any great amount, it occurs in mixture with the other hardwoods of the state, and the extent of its range conforms with theirs. The trees of this species have long, clean trunks, topped with a short crown, and are, therefore, capable of producing a much better quality of lumber than either Oregon oak or Oregon maple. Trees seventy-five feet in height and thirty inches in diameter are quite common, and much larger trees are often found.

The wood is pale brown, very hard and strong, tough, resilient

and fairly light. Oregon ash has an attractive grain and takes an excellent polish, which features greatly enhance its value for fixtures and furniture manufacture. Because of its strength, hardness, toughness and resilience it is well liked by vehicle and handle makers.

TABLE NO. 31—OREGON ASH.

INDUSTRY.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL.	COST OF GRADES USED PER M. FEET B. M.	
			Average.	Maximum.
Handles	240,000	53.84	†	
Furniture	158,300	35.51	$37.59	$60.00
Interior Work	20,000	4.49	30.00	35.00
Fixtures	12,500	2.79	36.00	40.00
Vehicles	10,000	2.25	40.00	40.00
Saddles	5,000	1.12	28.00	28.00
TOTAL	445,800	100.00		

† Cordwood.

Like Oregon oak and maple, the wide use of this wood suffers more from the infrequency of its occurrence than any lack of desirable qualities.

RED ALDER.

Red alder (Alnus oregona) is the largest of the Pacific Coast alders. Its commercial range is limited to the banks of streams and bottom lands west of the Cascades. Red alder trees often grow 60 to 75 feet in height and in diameter range from 18 to 30 inches or more. The long, slim, straight trunk yields excellent piling forms, and the resistance of the alder to the attack of marine borers gives it preference for use in the construction of docks and wharves in localities where it is accessible. Numerous instances of continuous use for fifteen years in salt water without apparent teredo attack have been noted. Owing to the very limited amount of this timber, its use for piling has been rather restricted.

TABLE NO. 32—RED ALDER.

INDUSTRY.	ANNUAL CONSUMPTION FEET B. M.	PER CENT OF TOTAL	COST OF GRADES USED PER M. FEET B. M.	
			Average.	Maximum.
Furniture	345,500	94.09	$28.00	$28.00
Saddles	8,000	2.17	27.00	27.00
Handles	7,200	1.97	42.00	42.00
Pulleys	5,500	1.49	20.00	25.00
Interior Work	1,000	.28	28.00	33.00
TOTAL	367,200	100.00		

This excellent hardwood tree aids greatly in mitigating the annoyance caused by the deficiency of hardwoods in the Northwest.

The wood is uniformly reddish brown in color, rather fine, even-grained, compact, hard and fairly strong. In addition, it turns and glues well, takes an excellent polish and shows no appreciable tendency to warp, check, shrink or swell.

The red alder makes an excellent imitation of mahogany, and this, along with its other good qualities, makes this wood of great value to Northwest furniture manufacturers.

Its strength and hardness, and the nicety with which it turns and polishes, give it preference in the manufacture of broom handles.

UTILIZATION OF WASTE.

Such a considerable amount of waste occurs in various forms in the manufacture of the numerous products discussed in the foregoing portion of this publication, that it seems advisable to include a few suggestions on the subject of waste utilization.

Records from various operators show that the waste in manufacturing the various products from the "soft woods," such as Douglas fir, Western hemlock, Sitka spruce, Western red cedar and the pines, can often be lessened by manufacturing the edgings and trimmings into such articles as mouldings, small sash stock, excelsior, fly traps, matches, towel racks, surveyors' stakes, tent toggles, lath, baluster squares, small drawer stock, kitchen and household knick-knacks, camp and doll furniture, toys, patterns and staves for tubs and pails. The sawdust and shavings of these species are commonly sold for horse bedding, although sawdust and hogged wood is now being used at Port Hadlock, Washington, in the manufacture of ethyl alcohol and cowfeed.

The "hard wood" waste problem is frequently ameliorated by the use of the small pieces for tabourettes, chair rounds, brackets, dowel pins, novelties, insulator pins, tent takes, tent toggles, deck plugs, wedges, inlaid work and saw, file, hammer, chisel and other tool handles. Hardwood sawdust is used in the manufacture of sweeping compounds and gunpowder, and is also valued for use in smoking meats and fish.

USES BY SPECIES.

The following list of uses of the various woods represent the reported uses of these woods in Oregon and Washington:

OREGON WOODS.

Black Cottonwood (Populus trichocarpa)—Baskets, boxes, candy barrels, caskets, cores of veneered products, excelsior, farm machinery, furniture (chair seats, couch heads, drawer bottoms, shelving), fixtures (drawer bottoms, shelving), pack saddles, pulleys, pulp, trunks, veneer, woodenware.

Douglas Fir (Pseudotsuga taxifolia)—Boats (beams, cabins, decking, finish, frames, keelsons, knees, masts, planking, spars, stems), boxes, bridge timbers, broom handles, cement pipe jackets, columns, crates, crossarms, decoy ducks, distillation, dump cars, elevator equipment, fixtures (backs, counters, facings, shelves), furniture (book cases, cabinets, chairs, cots, couch frames, drawers, kitchen and mission furniture, mirrors, spring frames, tables), fencing, foundry flasks, gutters, general house and structural material, hop baskets, interior work (casing, ceiling, finish, flooring, moulding, stair work, veneered doors, wainscoting), ladders, mine timbers, musical instruments, panels, patterns, paving blocks, piles, pulleys, pulp, rug poles, saddles, sash and doors, silo and tank stock, slack and tight cooperage, surveyors' stakes, ties, turnery, veneer, wagons, washing machines, wood stave pipe.

Myrtle (Umbellularia californica)—Boats (inside finish, pilot wheels), fixtures, furniture, musical instruments, novelties, turnery.

Noble Fir (Abies nobilis)—Boxes, baskets, crates, excelsior, interior work, pulp, veneer.

Oregon Ash (Fraxinus oregona)—Boats (finish and ribs), fixtures, furniture (book cases, chair stock, desks, tables), pick handles, saddles, wagons.

Oregon Maple (Acer macrophyllum)—Baskets, boat finish, building rollers, dollies, fixtures (counter tops, grill work, mirror frames, show cases), furniture (book cases, chairs, davenport frames, school furniture, spindles, tables), handles, interior work (finish, flooring), pulleys, saddles, tent toggles, trunk slats.

Oregon Oak (Quercus garryana)—Baskets, boats (frames, interior finish, keels, ribs, sills), fixtures, furniture (cabinets, chair stock, table tops), handles, interior work, insulator pins, saddles, wagons.

Port Orford Cedar (Chamaecyparis lawsoniana)—Boats (finish, frames, planking, skiffs), columns, fixtures, furniture (cabinets, moth-proof drawers, stools, tables), moth-proof chests, matches, sash and doors, turnery.

Red Alder (Alnus oregona)—Archery bows, broom handles, columns, furniture (chair seats, dressers, davenport frames, panels, tables), interior work (finish and mouldings), pack saddles, pulleys, turnery.

Sitka Spruce (Picea sitchensis)—Baskets, boxes (fruit, food, milk, packing cases, powder), boats (curved surfaces, ceiling, decking, planking, skiffs, spars), bread, drain and washboards, caskets, cooperage, cores of veneered products, crates, excelsior, fixtures (shelves), furniture (chair bottoms, couch frames, tables, table tops, Turkish rockers), interior work (mouldings, shelves), ladders, pattern work, pianos, pulleys, pulp, sash and doors, trunks, wagons (boxes and panels), woodenware.

Sugar Pine (Pinus lambertiana)—Boat finish, boxes, drawing boards, drain boards, fixtures (drawers and shelving), patterns, work boards.

Tamarack—Western Larch (Larix occidentalis)—Boxes, furniture, general building and structural material, interior work.

Western hemlock (Tsuga heterophylla)—Boat finish, boxes, caskets, cooperage, crates, fixtures (drawers, shelves), furniture (backing, couches, kitchen table tops), interior work (casing, ceiling, finish, flooring, moulding, wainscoting), pulp, sash and doors, screens, veneer.

Western Red Cedar (Thuja plicata)—Boats (cabins, ceiling, decking, finish, planking, skiffs), caskets, columns, cores of veneered products, drain boards, drawing boards, fence posts, fixtures (drawers, shelving, show cases), furniture (cabinets, drawer bottoms, panels), incubators, interior work (ceiling, finish, mouldings), ice cream tubs, moth-proof chests, panels, pattern work, railroad coaches, sash and doors, tank stock, turnery.

Western White Pine (Pinus monticola)—Boats (moulding,

planking), caskets, drain boards, fixtures (backing, drawers, shelving), fruit driers, furniture (drawer bottoms), interior work (casing, drawers, finish, mouldings, panels, shelves), patterns, wagon boxes.

Western Yellow Pine (Pinus ponderosa)—Agricultural machinery, bee hives, boats (finish and planking), boxes, fruit driers, furniture (backs, book cases, shelves), general building and structural material, interior finish, pattern work, saddles, sash and doors, store fixtures, wagons.

White Fir (Abies concolor)—Boxes, pulp.

NON-INDIGENOUS WOODS.

American Elm (Ulmus americana)—Furniture, trunk slats.

Basswood (Tilia americana)—Cigar boxes, railroad coaches.

Black Walnut (Juglans nigra)—Fixtures (church, mirror frames, show cases), furniture (cabinets).

Camphorwood—Musical instruments.

Circassian Walnut—Furniture (cabinets, veneer).

Eastern Ash (Fraxinus americana)—Automobile bodies, boat finish, fixtures, harvesters, interior work, railroad coaches, trunk slats, wagons, wagon poles.

Eastern Maple (Acer saccharum)—Agricultural machinery, boat finish, furniture (cabinets, dressers, tables, veneer), harness pins, harvesters, interior work, pattern work, stair treads, wagon axles.

Eastern Oak (Quercus alba)—Boats (cabins, finish, frames, guards, ribs, rudders, timbers), fixtures (bar, church altars, show cases, veneer), furniture (cabinets, rockers, tables, veneer), interior work (panels, rails, stairs), metallic boats (gunwales, keel, stern, stern posts), railroad cars, sash and doors, trunks, wagons (bodies, rims, spokes).

English Willow—Artificial limbs.

Hickory—Agricultural machinery, artificial limbs, furniture (clamp screws), harvesters, trunk slats, wagons (rims, spokes).

Ironbark—Boats (guard rails, nosing, fenders, rudder stock),

Mahogany—Boats (cabins, finish, pilot wheels), church fixtures, furniture (cabinets, tables, veneer), interior work (doors, stairs, mouldings), pattern work.

Red Birch (Betula lenta)—Fixtures, furniture (cabinets), interior work, railroad cars, wagons.

Red Gum (Liquidambar styraciflua)—Boat fenders, boxes, furniture (cabinets, table drawers), interior work, trunks.

Redwood (Sequoia sempervirens) — Cooperage, fixtures, (church altars), furniture (cabinets), incubators, interior work, pattern work.

Rock Elm—Wagon tongues.

Rosewood—Boats (mouldings, sash).

Rungus—Boats.

Siberian Oak (Quercus dentata)—Boats (frames, ribs, sills), furniture (davenports, cabinets, chairs, mouldings, tables), interior work, office fixtures.

Spanish Cedar (Cedrilla odorata)—Boats, cigar boxes, pattern work.

Teak—Boats (decking, finishing), pattern work.

Yellow Poplar (Liriodendron tulipifera)—Automobile bodies, boats, farm machinery, fixtures (church carving), furniture (clothes racks, cupboards, interior cabinets, shelves), interior work, pyrography, railroad coaches, wagons.

DIRECTORY OF OREGON WOOD-USING FIRMS

Baskets.

Perry Veneer Plant.....Bandon
Portland Basket & Handle Co.....Portland
Portland Manufacturing Co.....Portland

Boats.

T. L. Driscoll.....Astoria
Palo Bros. .....Astoria
Frank Smith .....Astoria
Wilson Bros. .....Astoria
Astoria Boat Co.....Astoria
Wm. W. Holland .....Marshfield
Columbia Boat & Machine Co.....Marshfield
Max Timmerman .....Marshfield
Kruse & Banks .....North Bend
O. P. Graham.....Portland
Frank Loller .....Portland
Portland Ship Building Co.....Portland
Joseph Supple .....Portland
W. H. & E. Von der Werth.....Portland

Boxes.

Roner Bros. .....Albany
Carson-Smith Lumber Co.....Ashland
Pioneer Planing Mill Co.....Ashland
Astoria Box Co.....Astoria
Clatsop Mill Co.....Astoria
Bridal Veil Lumbering Co.....Bridal Veil
H. D. Spencer & Co.....Elgin
J. H. Smith & Co.....Eugene
Glendale Box Factory.....Glendale
Campbell & Swigert.....Glendale
California Pine Box Co.....Grants Pass
Stanley-Smith Lumber Co.....Hood River
Willamette Box & Lumber Co.....Linnton
Coos Bay Manufacturing Co.....North Bend
Grande Ronde Lumber Co.....Perry
Multnomah Lumber & Box Co.....Portland
Oregon Box & Manufacturing Co...Portland
Portland Cigar Box Mfg. Co.....Portland
Portland Collapsible Box Co.....Portland
Standard Box & Lumber Co.....Portland
U. S. Planing Mill.....Roseburg
G. F. Mason .....Salem
Chas. A. White.....Scotts Mills
Multnomah Trunk & Bag Co.....Seaside
Columbia Lumber Co.....The Dalles
The Dalles Box & Lumber Co....The Dalles
J. M. Hursh.....Union
Union Pine Lumber Co.....Union
Blue Mountain Sawmill Co.....Weston
O. J. Hangeberg.....Yoncalla

Cooperage.

Finke Bros. .....Portland
Oregon Cooperage Co.....Portland
Pacific Cooperage Co.....Portland
Pacific Tank & Pipe Co.....Portland
Western Cooperage Co.....Portland

Elevators.

Columbia Elevator Co.....Portland

Excelsior.

Portland Manufacturing Co.....Portland
Eugene Excelsior Co.....Eugene
Gardner & Stayton.....Stayton

Fencing.

Anchor Fence Mfg. & Con. Works..Portland
East Portland Wire & Iron Works.Portland
Salem Fence Works.....Salem

Fixtures.

C. W. Seers & Son.....Albany
Roner Bros. .....Albany
Carlson & Kallstrom.....Portland
The Lutke Manufacturing Co.....Portland
J. I. Marshall Manufacturing Co...Portland
Povey-Spavy Manufacturing Co.....Portland
Parelius Manufacturing Co.....Portland
Portland Show Case & Fixture Co..Portland
Union Store Fixture Co.....Portland
F. M. Brown.....Salem

Furniture.

Roner Bros. .....Albany
Union Furniture Co.....Albany
R. Veal & Son.....Albany
E. C. Payne.....Ashland
Moyer & Van Natta.....Ashland
C. D. Goodnough.....La Grande
Mission Furniture Works.....Medford
V. L. Arrington.....Myrtle Point
Fancy Wood Specialties Co.....North Bend
Frueh Art Furniture Co.....Portland
Carman Manufacturing Co.....Portland
Doernbecher Manufacturing Co.....Portland
Kapus & Chamberlain.....Portland
Oregon Chair Co.....Portland
Oregon Furniture & Mfg. Co.....Portland
Peters Manufacturing Co.....Portland
Portland Furniture Mfg. Co.....Portland
L. Ruvensky .....Portland
Stayton Chair Co.....Stayton

Handles.

Pacific Coast Handle & Mfg. Co.....Dallas
Willamette Handle Factory....McMinnville
Oregon Handle Mfg. Co.....Newberg
Portland Handle & Singletree Mfg Co.
.....Portland
Standard Broom Co.....Portland
Zan Bros. .....Portland
The Valley Manufacturing Co.....Woodburn

Incubators & Brooders.

E. J. McClanahan.....Eugene

Interior Work.

C. W. Sears & Son.....Albany
M. J. Cameron & Son.....Albany
Carson-Smith Lumber Co.....Ashland
Pioneer Planing Mill Co.....Ashland
Moyer & Van Natta.....Ashland
Bennett & Son.....Baker City
M. M. Heacock.....Bay City
Central Planing Mill.....Corvallis
Cottage Grove Mfg. Co.....Cottage Grove
F. J. Coad .....Dallas
Dallas Planing Mills.....Dallas
Eugene Planing Mill Co.....Eugene
McMinnville Planing Mill.....McMinnville
Acme Planing Mill Co.....Portland
Frueh Art Furniture Co.....Portland
Multnomah Lumber & Cons. Co.....Portland
Nicolai-Neppach Co.....Portland
Northwest Door Co.....Portland
Oregon Door Co.....Portland
Oregon Planing Mills.....Portland
Portland Sash & Door Co.....Portland
Frank Schmitt & Co.....Portland
W. H. Wilton.....Portland
The J. G. Flook Co.....Roseburg
F. M. Brown.....Salem
A. M. Hansen.....Salem
W. C. Andrews.....Silverton
The Springfield Planing Mill Co..Springfield

Musical Instruments.

F. E. Coulter.....Portland
Eilers Piano House.....Portland
Gurdon Bertram.....Portland

Patterns.

McLynn Pattern Works.....Portland
Nicolai-Neppach Co.....Portland
Northwest Blow Pipe Co.....Portland
Phoenix Iron Works.....Portland
Portland Pattern Works.....Portland
Prehn & Michaels.....Portland
West Side Pattern Works.....Portland

Pulleys.

M. M. Heacock .....Bay City
McLynn Pattern Works.....Portland
Portland Pulley Co.....Portland

Pulp and Paper.

Lebanon Paper Co.....Lebanon
Willamette Pulp & Paper Co.....Oregon City
Hawley Pulp & Paper Co.....Oregon City
Crown-Columbia Pulp & Paper Co. .....Oregon City

Saddles & Stirrups.

Leisure & Van Bebber.....Portland
Peiffer Bros. Leather Co.....Portland
Western Saddle Tree Co.....Portland

Sash & Doors.

C. W. Sears & Son.....Albany
M. J. Cameron & Son.....Albany
Pioneer Planing Mill Co.....Ashland
Clatsop Mill Co. .....Astoria
M. M. Heacock.....Bay City
Central Planing Mill .....Corvallis
Cottage Grove Mfg. Co.....Cottage Grove
F. J. Coad.....Dallas
Eugene Planing Mill Co.....Eugene
Morgan-Stansbie Co.....Eugene
George Midgley .....Eugene
J. H. Smith & Co.....Eugene
Williams Bros. Door & Lbr. Co..... .....Grants Pass
McMinnville Planing Mill.....McMinnville
Medford Sash & Door Co.....Medford
North Bend Mfg. Co.....North Bend
Acme Planing Mill Co.....Portland
Multnomah Lbr. & Box Co.....Portland
Nicolai-Neppach Co. .....Portland
Northwest Door Co.....Portland
Oregon Door Co.....Portland
Oregon Planing Mills .....Portland
Pacific Coast Door Co.....Portland
Povey-Spavy Mfg. Co.....Portland
Parelius Mfg. Co.....Portland
Portland Sash & Door Co.....Portland
Frank Schmitt & Co.....Portland
Columbia River Door Co.....Rainier
The J. G. Flook Co.....Roseburg
U. S. Planing Mill Co.....Roseburg
F. M. Brown.....Salem
Seaside Lbr. & Shingle Co.....Seaside
Springfield Planing Mill Co.....Springfield

Vehicles.

Shields & Kennedy .....Bandon
Mitchell & Boek .....Medford
J. H. Miller.....Oakland
City Carriage & Wagon Works.....Portland
Columbia Carriage & Wagon Works.... ..... Portland
A. C. Cooper .....Portland
Eureka Carriage Works.....Portland
H. A. Kuehle .....Portland
Pennison & McFarlin .....Portland
Morse & Fontana.....Portland
North Pacific Wagon Works.....Portland
Northwest Blow Pipe Co.....Portland
Jens Olsen .....Portland
Paul Preuschhof .....Portland
G. G. Stacey .....Portland
E. M. Tucker.....Portland

Veneers.

Perry Veneer Plant.....Bandon
Coos Bay Mfg. Co.....North Bend
Multnomah Lbr. & Box. Co.....Portland
Portland Mfg. Co.....Portland

Wood Stave Pipes.

Pacific Tank & Pipe Co.....Portland
Portland Wood Pipe Co.....Portland

Miscellaneous.

Oregon Wood Distilling Co., turpentine, tar, tar oils, charcoal.....Linnton
Adam Loch & Sons, piano trucks..Portland
Frank Newton & Co., ladders.....Portland
Oregon Artificial Limb Mfg. & Supply Co. .....Portland
Peerless Trunk Co.....Portland
Portland Cigar Box Mfg. Co.....Portland
Portland Trunk Mfg. Co.....Portland
W. H. Thompson, cots.....Portland
Zan Bros., matches .....Portland
H. S. Jory & Son, fruit driers.....Salem
Willamette Mfg. Co., caskets.....Salem